Project Title: Developing and Utilizing Isotopic and Tracer Tools to Evaluate the Source and Movement of Nitrate in Contaminated Ground Water in the Lower Umatilla Basin, Oregon (GWERD/EPA Region 10 RARE Project DW14994101)

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Project Period: 08/01/2003 - 06/30/2006

GPRA Goal: This is a Regional Applied Research Effort (RARE) project with EPA Region 10. Research addresses WQ MYP LTG2/APG 94. Specific APMs will be developed for this project.

Abstract: The Lower Umatilla Basin Ground Water Management Area (GWMA) is a 550 square-mile area which stretches from Pendleton, Oregon to the Columbia River. The area features a complex ground water flow system which is characterized by nitrate concentrations which often greatly exceed the drinking water standard (>7 mg/l nitrate - N). Five major sources of ground water nitrate in the basin have been identified including irrigated agriculture, food processing waste land application, CAFOs, an army base ordinance depot, and septic systems. The objectives of this research are to answer two questions: (1) what is the source of the nitrate in specific wells and (2) how long has the nitrate been migrating from the source. The approach to answer these questions is to develop isotopic tools to identify which of the five sources of nitrate are present in a particular well and "time of travel" techniques to determine how long the nitrate has been traveling from the source. Three sites have been selected for this study based on their proximity to significant sources of nitrate. Ground water samples at and down gradient of the sites are being collected and tested for stable isotopes of including N^{15} and O^{18} of nitrate as well as major cation-anion suites and other constituents identified as beneficial to the characterization. Age dating using helium in-growth is being used for "time of travel" estimates. Based on the results from this study and prior studies using isotopes to distinguish nitrate sources, an isotopic tool will be developed to discriminate nitrate sources in the Lower Umatilla Basin. In addition, standard operating procedures (SOPs) for sampling and analytical isotopic fingerprinting procedures/tools to identify nitrate sources will be prepared. The tools developed from this work will enable one to determine if the nitrate present in ground water in the target basin arises from legacy or current waste water management practices. Answers to these questions will allow federal and state entities to focus resources on the most significant of the multiple sources of ground water nitrate in the Lower Umatilla Basin Management Area. In this way, management practices can be implemented which will begin to lower nitrate levels with improvements to human health and the environment to follow. In addition, these tools may be transferrable to other basin management areas.

Status: In January 2004 three sites were selected based on their unique nitrate sources and initial geochemical screening of these sites was completed. In September 2004, intensive geochemical, isotopic and age dating sampling was completed at all three sites**.**

Products: Expected products include SOPs to identify sources of nitrate in ground water samples, a peer reviewed journal article describing the use of stable isotopes to fingerprint sources of nitrate in the Umatilla Basin, and an EPA report describing the complete project, with guidelines on the use of the time of travel and isotopic tools for fingerprinting nitrate sources in ground water.